

radial sector. The general character, however, seems to be that of *Mindarus*.

It would be impossible to place definitely with their allies many of the species described by Scudder. One thing, however, seems certain. None fall in the subfamily Eriosomatinae (Schizoneurinae) in which he placed them. While details of structure cannot be seen, this fact is evident from the general nature of the specimens.

With the exception of those forms falling in the Mindarinae, all of Scudder's specimens, with one exception, are different from forms in recent genera. This species is *Oryctaphis lesueurii*. I am unable to make this form agree with the description and figure unless what shows as the stigma and radial sector are something quite different. The stigma appears to be truncate and the radial sector short and heavy like certain recent forms in the Lachnina. If this is actually the case, it indicates a remarkable difference from the other Florissant forms, all of which possess an extended stigma and a long radial sector arising far back on it. *O. recondita*, the second species of this genus, is quite different. It is very large and is not improbably a *Mindarus*. Scudder's figure hardly gives an accurate representation of it. The radial sector arises near the base of the stigma. The media can be traced almost to its base, and a branch is indicated very near its tip, much nearer than indicated in Scudder's figure. Scudder believed that this vein was twice branched but I believe the branch visible in the specimen to be the only one and that the insect might with good reason be grouped with *Mindarus*.

Many of the fossil aphids in the Scudder collection are not well preserved and it is perhaps as well to let them rest in the genera he described for them. Certain general characters are, however, worthy of mention. The most striking is the extension of the stigma and the insertion of the long radial sector. In many specimens the antennae are very long, suggesting some of the slender antennae in the Callipterina. Cornicles appear not to be present, and there seems little doubt that if the aphids possessed these heavily chitinized structures in any prominence traces of them would be preserved with the less delicate ones. Prominent cornicles are present in some of the species in amber, but these species have quite a recent aspect. We are forced to conclude that the cornicles were not prominently developed when the Florissant deposits were laid down. In only one specimen can I find traces of what may have been cornicles. This is a form which Scudder described as *Aphidopsis* sp. (No. 1044). In his description

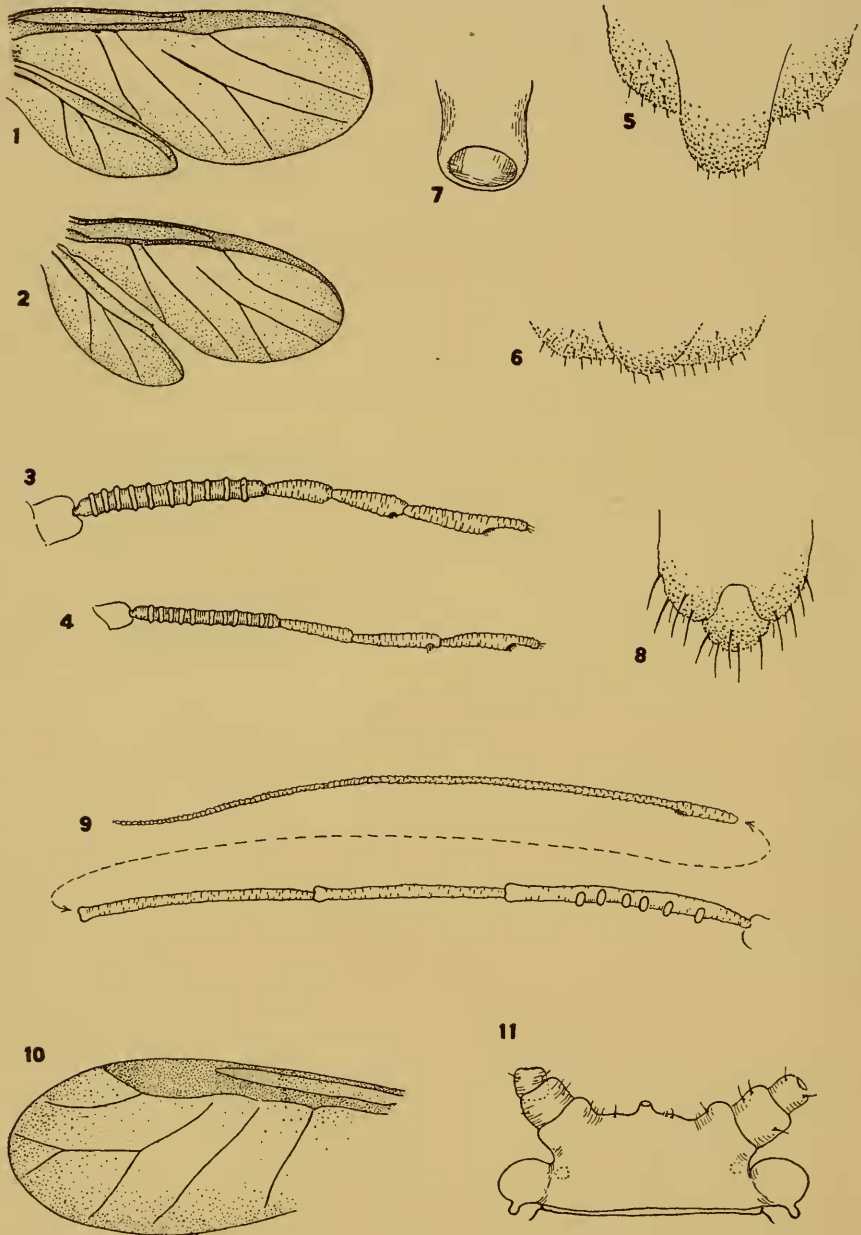


Fig. 1.—1, *Mindarus magnus*, wings; 2, *M. abietinus*, wings; 3, *M. magnus*, antenna; 4, *M. abietinus*, antenna; 5, *M. abietinus*, cauda and anal plate; 6, *M. magnus*, cauda and anal plate; 7, *Calaphis scudderi*, cornicle; 8, *C. scudderi*, cauda and anal plate; 9, *C. scudderi*, antenna; 10, *C. scudderi*, fore wing; 11, *C. scudderi*, head.

he mentioned these structures and described the insect as immature. It is, however, an alate specimen which has lost the wings, or possibly an intermediate, for the structure of the thorax is well preserved and the ocelli are visible. The cornicles, if they are cornicles, are broad at the base, short and somewhat tapering. The cauda seems to be knobbed and the anal plate bilobed. The entire insect suggests the genus *Euceraphis*.

A detailed reference to the other specimens in the collection could add little to the knowledge already available, but I believe that the remarks here given, together with the detailed description of the amber species, are sufficient to support the view that *Mindarus* is a genus formerly dominant but now represented by the solitary, cosmopolitan, conifer-feeding species *abietinus*.

The descriptions of the amber species given herein are the first in which any attempt has been made to give the more minute details of structure as is done in the description of living forms. This has been possible by use of the same high magnification adopted in studying recent aphids and the employment of powerful illumination. Even with the best light available, however, certain desirable characters remain obscured.

***Mindarus magnus* Baker, n. sp.**

Alate viviparous female.—Head, thorax, and appendages appearing as dark brown. Abdomen yellowish, possibly greenish in life, with a large dark central dorsal marking irregular in outline. Wings transparent, the veins and stigma brown.

Length from vertex to tip of cauda 2 mm., width of head across the eyes 0.48 mm. Fore wing (Fig. 1) 2.88 mm. \times 1.2 mm. at its greatest diameter. Hind wing 1.28 \times 0.56 mm. Antenna (fig. 3) extending about to the wind insertions, segment III 0.24 mm. with 9 or 10 transverse sensoria, IV 0.08 mm., V 0.096 mm., VI (0.112 + 0.048 mm.), these segments distinctly imbricated and bearing the usual fringed sensoria. The measurements given for the antennal segments cannot be considered absolutely exact in view of the fact that they are not perfectly horizontal in the amber. In the second specimen, segment III of one antenna is 0.304 mm. long and segment IV appears to have 2 or 3 sensoria. Cauda and anal plate not distinctly visible but apparently as in Fig. 6, cauda possibly more extended in life. Cornicles obscured. Beak long, extending to about the middle of the abdomen.

Nymph.—What is possibly the 2nd instar of this species is herewith described.

Length from vertex to tip of cauda 0.896 mm. Length from vertex to tip of beak 1.36 mm. Antennal segments with the following measurements: I 0.032 mm., II 0.048 mm., III 0.032 mm., IV 0.032 mm., V 0.048 mm., IV (0.048 + 0.048 mm.). Form elongate, rather slender, segmentation distinct, color appearing brownish.

Mindarus magnus differs from *M. abietinus* in being much larger, in having a longer beak and in having somewhat stouter and relatively shorter antennae.

Described from three specimens in as many blocks, two alate specimens of which the type has the wings spread and one young nymph. The type and paratypes are temporarily retained in the author's collection.

***Calaphis scudderi* Baker, n. sp.**

Alate viviparous female.—Head, thorax, and appendages appearing dark brown. Wings transparent with rather heavy veins. Abdomen brownish with dark markings above.

Length from vertex to tip of cauda 1.28 mm. to tip of wings 1.92 mm. Head (fig. 11) with the eyes very prominent and the antennal insertions distinctly transverse, median ocellus outstanding. Antenna (fig. 9) as follows: III 0.352 mm. with a row of sensoria which stand out distinctly, IV 0.256 mm., V 0.32 mm., VI (0.08 + 0.864 mm.). Segments distinctly imbricated, the distal one with the base not prominently marked off from the unguis, in this respect resembling *Monaphis antennata* (Koch). Cornicles (fig. 7) faintly visible but apparently short, somewhat tapering, with a slight constriction, and a large opening. Wings not unusual, the fore wing (fig. 10) showing a truncate stigma with a short distally set radial sector which is little curved.

Cauda and anal plate (fig. 8) not clearly visible, but the anal plate somewhat bilobed and the cauda from the visible portion in all probability knobbed.

Described from one specimen with the wings folded over the back. Type temporarily retained in the author's collection.

I have placed this species in the genus *Calaphis* because it seems nearer this than to any described and I am loath to erect a new one for its reception. It represents a type of insect not present in the Florissant material but which is the usual type of living forms. This is especially evident in the wing, in the shape of the stigma and the radial sector. It indicates that while the more primitive forms represented by *Mindarus* are present in the Florissant beds and abundant in amber, the more recent type, dominant today, appears only in the amber.

GEOLOGY.—*The Lower Paleozoic section of southeastern Pennsylvania.*¹

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The facts here presented are the results of comprehensive geologic studies in connection with detailed surveys in southeastern Pennsylvania by the writers and Eleanora Bliss Knopf for the Federal Geological Survey and the Pennsylvania State Geological Survey. A brief preliminary statement of the Paleozoic section that has been worked out and the formation names that have been applied are given in this paper.

Twelve miles east of Lancaster, Pa., the Cambrian quartzites of Welsh Mountain plunge southwestward beneath the limestones of the Lancaster Valley and rise again a few miles west of Lancaster in the Hellam-Chickies Hills.

¹ Published with the permission of the Director of the U. S. Geological Survey and the State Geologist of Pennsylvania. Received August 5, 1922.

The divisions recognized in the quartzites and limestones of this area and described below, are as follows:

GENERALIZED COLUMNAR TABLE

| Age | Name | Thickness (ft.) | Character of Rocks |
|-----------------|-------------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ordovician | Conestoga limestone (probably older than, or in part equivalent to, Cocalico shale) | 500 ± | Dark slaty limestone, coarse limestone and marble conglomerate, thin-bedded granular blue limestone, and thin graphitic slate. Contains brachiopods and crinoid plates and stems of probably Chazy age. Overlaps south-eastward on all formations from the Ledger dolomite to the Harpers schist. |
| | Cocalico shale | 1000 ± | Dark gray shale containing graptolites of Normanskill type and thin crinoidal limestone at base; gray, green, and purple slates and green impure sandstone above. |
| Upper Cambrian | Beekmantown limestone | 2000 ± | Light blue limestone and some light gray magnesian limestone and dolomite, containing a little chert. Carries Beekmantown fossils. |
| | Conococheague limestone | 900 ± | Massive blue limestone containing <i>Cryptozoon</i> reefs, thin-bedded wavy laminated limestones, sandstones and sandy conglomerates, and dolomite. |
| | Elbrook dolomite | 500 ± | Cream-colored to white, fine-grained impure marble, mostly thinly laminated; weathers to shaly yellow tripoli and yellow earthy soil. |
| | Unconformity | | |
| | Ledger dolomite | 1000 ± | Granular, gray to white dolomite, mostly thick-bedded, some beds of which are siliceous and weather to rust-stained granular cherty layers. |
| Middle Cambrian | Kinzers formation | 150 | Siliceous banded dark blue limestone, impure dolomite weathering to dense buff tripoli, spotted white marble with wavy impure partings, and shale which contains an <i>Olenellus</i> fauna. |
| | Vintage dolomite | 500-650 | Massive, glistening, coarse-grained, dark gray dolomite, weathering whitish with scattered crystalline blebs, and dark blue dolomite with argillaceous partings, weathering knotty or lenticular. |
| Lower Cambrian | Equivalent to Tomstown dolomite | | |

| | | | | | |
|----------------|-------------------|----------------------------|------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lower Cambrian | Arenaceous series | Hellam-Chickies Hills | Welsh Mtn. | | |
| | | Antietam quartzite | 200± | 150± | Vitreous and granular impure quartzite, the upper part of which contains <i>Obolella</i> and trilobite fragments. |
| | | Harpers phyllite | 1000± | 1500± | Greenish gray phyllite or biotite schist. |
| | | Chickies quartzite | 1000 | 550 | Massive-bedded, <i>Scolithus</i> -bearing, light-colored vitreous quartzite, grainy quartzite with clear quartz grains, and some white clay beds in upper part. |
| | | Hellam conglomerate member | (600) | (150) | Quartz conglomerate, grainy quartzite with rounded clear and blue quartz grains, and slate chlorite schist at base in Hellam Hills. |
| | Unconformity | | | | |
| | Pre-Cambrian | | | Greenstone and aporhyolite in Hellam Hills; gneiss and granitic rocks in Welsh Mountain and Barren Hills. | |

Most of the Lower Cambrian arenaceous series is well exposed in the gorge of the Susquehanna River through the Hellam-Chickies Hills. The quartzite at Chickies Rock has been called Chickies quartzite since 1878, when the name was first used by Lesley and Frazer; they also used Hellam quartzite for the same rocks in Hellam Hills. Lesley and Frazer applied the name Chickies (Chickis) to the quartzite and associated "quartz slate" but not to the overlying phyllite, and later Walcott followed the same usage, applying the name Chickies to the quartzite. Conglomerate at the base of the arenaceous series was not mentioned by these early writers and apparently was not seen by them, as it is not exposed at Chickies Rock. It is brought to the surface three miles to the west in the midst of the Hellam Hills, where the anticline rises higher, and is there included in what was later called by Lesley Chickies quartzite. These basal conglomeratic beds, to which the name Hellam conglomerate member is here applied, correspond in general with the Weverton and Loudoun formations of South Mountain. The Hellam conglomerate member lies on epidotic amphibolite schist or greenstone and aporhyolite, which are altered volcanic rocks related to the pre-Cambrian metabasalt or Catoctin schist and aporhyolite of South Mountain. The basal beds of the conglomerate here are chlorite schist which contains glassy quartz grains and flat fragments of chloritic and rhyolitic schists,